Evaluating the Economic Consequences of a Natural Disaster

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Measurement Approaches

- We have many ways of measuring the economic consequences of a natural disaster

  1) Compilation of damages, losses, and costs

  2) Trend analysis of local economic indicators

  3) Impact assessment using statistical models

- Each approach has its own strengths and limitations

1) Damages, Losses, and Costs

- Tabulations of damages, losses, and costs usually provide our earliest sources for post-disaster economic data:
  - Damages – physical outcomes
  - Losses – market value of damages or disruptions
  - Costs – dollar amount of payments to repair damages or compensate losses
- *Estimates of damages, losses, and costs are used primarily to obtain disaster declarations and recovery assistance*

Damages and Loss Tabulations

Limitations for Disaster Assessment

- May overstate some kinds of losses and understate others
- Counts economic activity that simply shifts from one firm to another as a loss to the regional economy
- Fails to account for offsetting economic activity stimulated by recovery efforts
- Business and household losses ≠ economic impacts

2) Trend Analysis

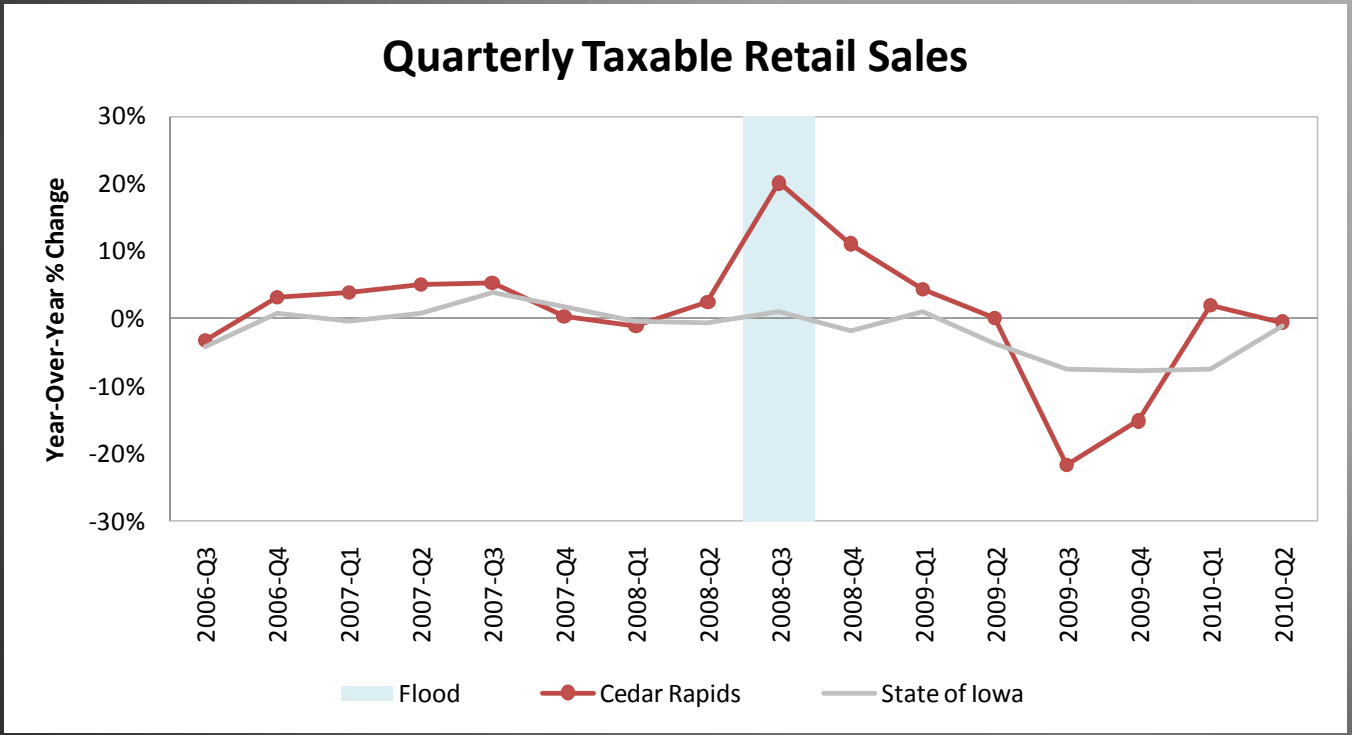
- We can use primary or secondary data to detect changes in local economic trends before and after a natural disaster
- Useful indicators for local trend analysis:
  - Population
  - Enrollment
  - Retail sales
  - Unemployment
  - Employment
  - Commuting patterns

Trend Analysis of Secondary Data

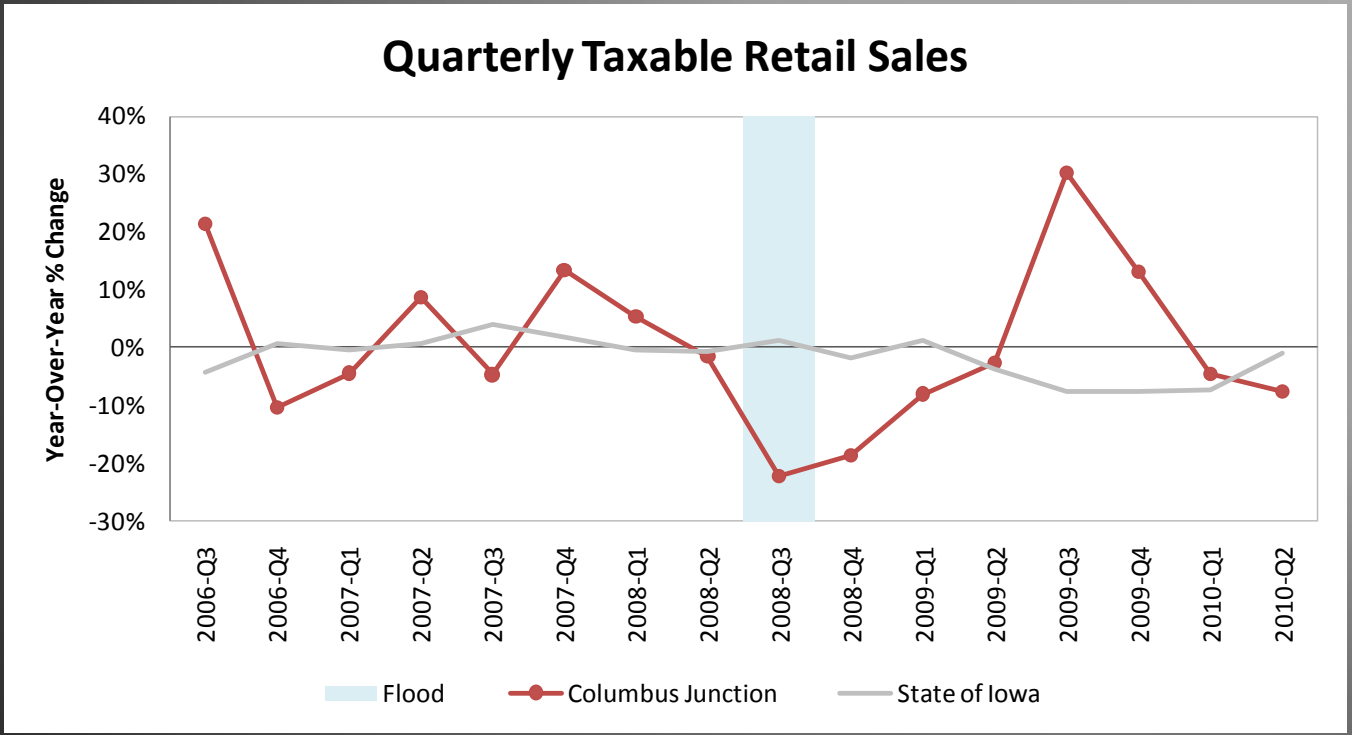
What We Found in the Study Areas

- Short-term disruptions, both positive and negative, in retail trade
- Impossible to distinguish flood effects from recession effects
- No evidence of lasting disruptions in pre-flood trends in population, enrollment, employment, or area commuting patterns

Example 1: Retail Boost



Example 2: Retail Decline



Trend Analysis:
Limitations for Disaster Assessment

- Long lag times for publication of data
- Lack of city or neighborhood-level data
- Difficult to establish CAUSALITY between the disaster event and changes in trends

3) Impact assessment using Economic Modeling

Types of Economic Model

a) Input-output (I-O) models

- produce estimates of economic "impacts"
- measure changes in regional productivity or jobs

b) Cross-sectional models

- measure relationships among economic, social, or other variables of interest
- useful when time series data are scarce

Basis for Input-Output Models

Firms in a region demand inputs from other firms in the region. The dollar amount of these transactions can be summarized as follows:

		Buying Industries		
	Industry A	Industry B	Industry C	…
Industry A	$100	$200	$10	
Industry B	$75	$400	$200	
Industry C	$25	$50	$100	
All Other Industries	$50	$300	$100	
Total payments	$250	$950	$410	

These supply & demand relationships among firms in a region are used to estimate how growth or contraction in one industry might "ripple through" to affect the remaining industries.

Basis for Input-Output Models

Firms in a region demand inputs from other firms in the region. The dollar amount of these transactions can be summarized in a payments matrix:

Inter-Industry Transactions ($ millions)		Buying Industries				
		Industry A	Industry B	…	Exports	Total Outputs
Selling Industries	Industry A	…	700	…	…	…
	Industry B	200	400	800	1,200	2,600
	…	…	900	…	…	…
	Imports	…	600	…	…	…
	Total Inputs	…	2,600	…	…	…

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Input-Output Modeling
What We Asked

- What would be the economic impacts, **as measured in jobs**, of flood-related losses of various types of local businesses?

Input-Output Modeling
What We Found

- Economic impacts of the floods varied by county urbanization level
  - *Weaker* multiplier effects in *smaller* cities/counties
  - *Stronger* effects in *large cities/counties* due to greater degree of linkages among industries
- Economic impacts of floods varied by type of affected business:
  - Lower impacts for trade/service firms
  - Higher impacts for manufacturing firms

Input–Output Models

Estimated Job Impacts for Two Flood Scenarios

Study Area	*Scenario 1: Loss of 10 Manufacturing Jobs*	*Scenario 2: Loss of 10 Trade/Service Jobs*
Benton	17.8	13.1
Black Hawk	16.8	12.6
Cerro Gordo	17.7	13.0
Floyd	13.0	11.6
Johnson	17.9	13.3
Linn	19.1	13.5

Housing Demand Model:
What We Asked

- How did ***local employment gains or losses***, (resulting from the recession and/or the floods) *affect the overall demand for housing units* in the community?

Housing Demand Model
What We Did

- Compiled data for 1,000 urban census tracts in Iowa and surrounding counties
- Developed a regression model to estimate the expected relationships between local employment, occupied housing units, vacancy rates, and other relevant variables

c2) Housing Model Regression Equations

Equation 1

$$Occupied\ units = f(resident\ workforce\ size, vacancy\ rate, population\ density, median\ household\ income, median\ housing\ value, recent\ population\ growth\ rate, and\ percentage\ of\ residents\ 65\ years\ or\ older)$$

Equation 2

$$Vacancy\ rate = f(resident\ workforce\ size, population\ density, median\ household\ income, median\ rent, unemployment\ rate, worker\ outcommuting\ rate, recent\ population\ growth\ rate, and\ percentage\ of\ housing\ units\ built\ before\ 1940)$$

Housing Demand Model
What We Found

- Regional job losses led to a decrease in estimated housing demand in 4 communities
  - Charles City, Mason City, Waterloo, and Waverly
- Regional job gains led to an increase in estimated housing demand in 4 communities
  - Cedar Rapids, Columbus Junction, Coralville, and Iowa City

Economic Modeling
Limitations

- Estimated impacts are based on “average” relationships between variables of interest.
- Models may not capture unique local attributes/experiences.
- Models are impersonal, and may seem to minimize individual household/business losses.

Limitations for Disaster Assessment

a) Damages and Loss Tabulations	b) Trend analysis	c) Economic Modeling
May overstate some kinds of losses and understate others	Long lag times for publication of data	Estimated impacts are based on "average" relationships between variables of interest
Counts economic activity that simply shifts from one firm to another as a loss to the regional economy	Lack of city or neighborhood-level data	Models may not capture unique local attributes/experiences
Fails to account for offsetting economic activity stimulated by recovery efforts	Difficult to establish CAUSALITY between the disaster event and changes in trends	Models are impersonal, and may seem to minimize individual household/business losses
Business and household losses ≠ economic impacts		

- For more information, contact

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Thank YOU!!!!!